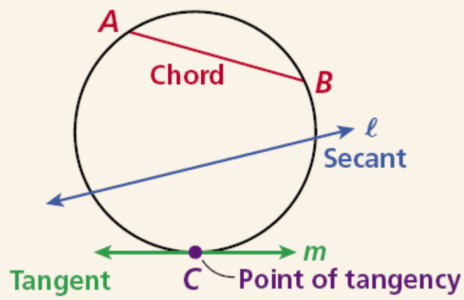
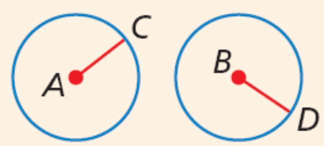
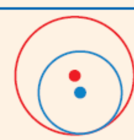
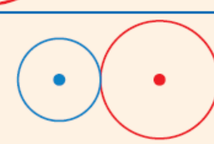
Pre-AP Geometry 12-1: Lines that intersect Circles

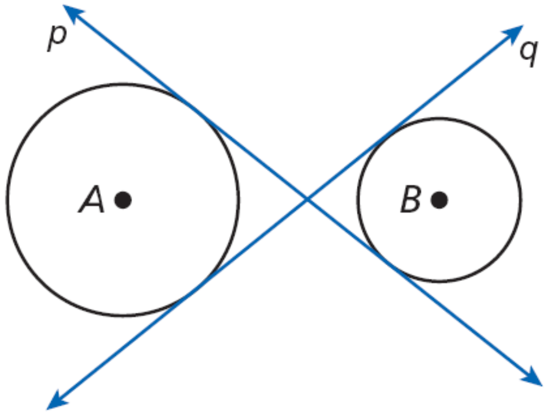
Lines and Segments That Intersect Circles

TERM	DIAGRAM
A **chord** is a segment whose endpoints lie on a circle.	
A **secant** is a line that intersects a circle at two points.	
A **tangent** is a line in the same plane as a circle that intersects it at exactly one point.	
The point where the tangent and a circle intersect is called the **point of tangency**.	

Pairs of Circles

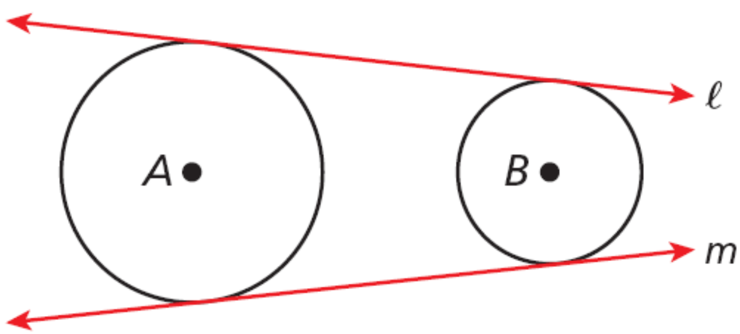
TERM	DIAGRAM
Two circles are **congruent circles** if and only if they have congruent radii.	 $\odot A \cong \odot B$ if $\overline{AC} \cong \overline{BD}$. $\overline{AC} \cong \overline{BD}$ if $\odot A \cong \odot B$.
Concentric circles are coplanar circles with the same center.	
Two coplanar circles that intersect at exactly one point are called **tangent circles**.	 Internally tangent circles  Externally tangent circles

A **common tangent** is a line that is tangent to two circles.



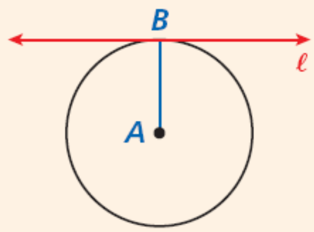
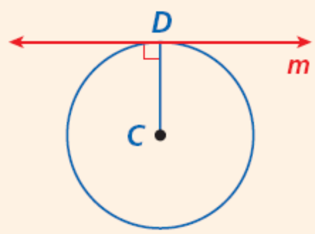
Lines ***p*** and ***q*** are common internal tangents to ⊙*A* and ⊙*B*.

A **common tangent** is a line that is tangent to two circles.

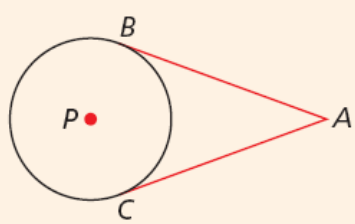


Lines ***ℓ*** and ***m*** are common external tangents to ⊙*A* and ⊙*B*.

Theorems

THEOREM	HYPOTHESIS	CONCLUSION
11-1-1 If a line is tangent to a circle, then it is perpendicular to the radius drawn to the point of tangency. (line tangent to $\odot$ → line $\perp$ to radius)	 ℓ is tangent to $\odot A$	$\ell \perp \overline{AB}$
11-1-2 If a line is perpendicular to a radius of a circle at a point on the circle, then the line is tangent to the circle. (line $\perp$ to radius → line tangent to $\odot$)	 m is $\perp$ to $\overline{CD}$ at D	m is tangent to $\odot C$.

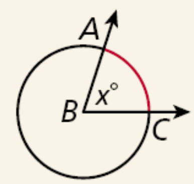
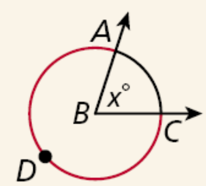
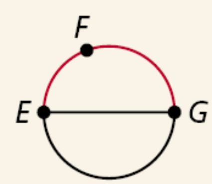
Theorem 11-1-3

THEOREM	HYPOTHESIS	CONCLUSION
If two segments are tangent to a circle from the same external point, then the segments are congruent. (2 segs. tangent to $\odot$ from same ext. pt. → segs. $\cong$)	 $\overline{AB}$ and $\overline{AC}$ are tangent to $\odot P$.	$\overline{AB} \cong \overline{AC}$

Pre-AP Geometry 12-2: Arcs and Chords

A **central angle** is an angle whose vertex is the center of a circle. An **arc** is an unbroken part of a circle consisting of two points called the endpoints and all the points on the circle between them.

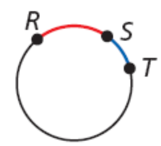
Arcs and Their Measure

ARC	MEASURE	DIAGRAM
A **minor arc** is an arc whose points are on or in the interior of a central angle.	The measure of a minor arc is equal to the measure of its central angle. $m\overset{\frown}{AC} = m\angle ABC = x°$	
A **major arc** is an arc whose points are on or in the exterior of a central angle.	The measure of a major arc is equal to 360° minus the measure of its central angle. $m\overset{\frown}{ADC} = 360° - m\angle ABC$ $= 360° - x°$	
If the endpoints of an arc lie on a diameter, the arc is a **semicircle**.	The measure of a semicircle is equal to 180°. $m\overset{\frown}{EFG} = 180°$	

Writing Math

Minor arcs may be named by two points. Major arcs and semicircles must be named by three points.

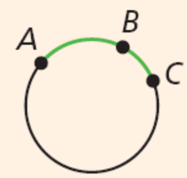
Adjacent arcs are arcs of the same circle that intersect at exactly one point. $\overset{\frown}{RS}$ and $\overset{\frown}{ST}$ are adjacent arcs.



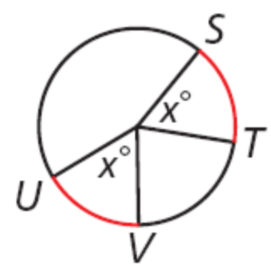
Postulate 11-2-1 **Arc Addition Postulate**

The measure of an arc formed by two adjacent arcs is the sum of the measures of the two arcs.

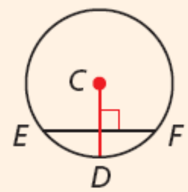
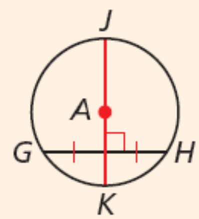
$$m\overset{\frown}{ABC} = m\overset{\frown}{AB} + m\overset{\frown}{BC}$$



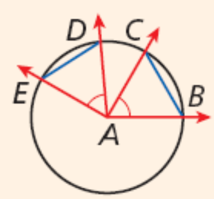
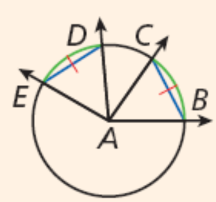
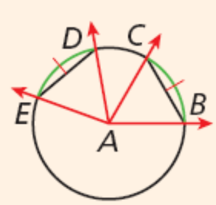
Within a circle or congruent circles, **congruent arcs** are two arcs that have the same measure. In the figure $\overset{\frown}{ST} \cong \overset{\frown}{UV}$.



Theorems

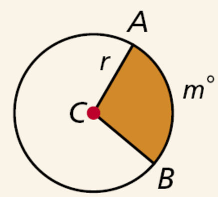
THEOREM	HYPOTHESIS	CONCLUSION
11-2-3 In a circle, if a radius (or diameter) is perpendicular to a chord, then it bisects the chord and its arc.	 $\overline{CD} \perp \overline{EF}$	$\overline{CD}$ bisects $\overline{EF}$ and $\overset{\frown}{EF}$.
11-2-4 In a circle, the perpendicular bisector of a chord is a radius (or diameter).	 $\overline{JK}$ is $\perp$ bisector of $\overline{GH}$.	$\overline{JK}$ is a diameter of $\odot A$.

Theorem 11-2-2

THEOREM	HYPOTHESIS		CONCLUSION
In a circle or congruent circles:			
(1) Congruent central angles have congruent chords.		$\angle EAD \cong \angle BAC$	$\overline{DE} \cong \overline{BC}$
(2) Congruent chords have congruent arcs.		$\overline{ED} \cong \overline{BC}$	$\overset{\frown}{DE} \cong \overset{\frown}{BC}$
(3) Congruent arcs have congruent central angles.		$\overset{\frown}{ED} \cong \overset{\frown}{BC}$	$\angle DAE \cong \angle BAC$

Pre-AP Geometry 12-3: Sector Area and Arc Length

Sector of a Circle

TERM	NAME	DIAGRAM	AREA
A **sector of a circle** is a region bounded by two radii of the circle and their intercepted arc.	sector *ACB*		$A = \pi r^2\left(\frac{m°}{360°}\right)$

A **segment of a circle** is a region bounded by an arc and its chord.

Area of a Segment

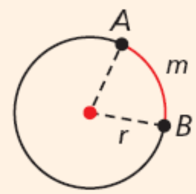
area of segment = area of sector − area of triangle

Remember!

In a 30°-60°-90° triangle, the length of the leg opposite the 60° angle is $\sqrt{3}$ times the length of the shorter leg.

In the same way that the area of a sector is a fraction of the area of the circle, the length of an arc is a fraction of the circumference of the circle.

Arc Length

TERM	DIAGRAM	LENGTH
Arc length is the distance along an arc measured in linear units.		$L = 2\pi r\left(\frac{m^\circ}{360^\circ}\right)$